

## MULE DEER GPS COLLAR TECHNOLOGY

### Fact Sheet #37

Global Positioning System (GPS) collars have widespread use in mule deer research and management, relying on a network of satellites to record the animal's location at regular time intervals. Data collected from GPS collars are commonly used to analyze mule deer movements, distribution, survival, and habitat use. Advances in technology such as batteries and electronic components have made GPS collars smaller, lighter, and cheaper; while improvements in satellite systems have increased accuracy of location data. This technology allows agencies to collar hundreds to thousands of animals, giving wildlife researchers and managers the unprecedented ability to better understand mule deer movement, behaviors, ecology, and factors influencing survival, thereby improving management of mule deer and their habitat.

### GPS COLLARS – DEPLOYMENT, DATA COLLECTION, AND RECOVERY

Mule deer are typically captured using helicopter net-gunning, drive-netting, darting with chemical immobilization, or live trapping. Once captured, wildlife biologists custom fit the deer with a GPS collar based on its size, age, and sex. For example, fawn or buck collars are often fit with extra room or an expansion piece to allow for growth or neck swelling. Some GPS units are now small enough to fit in an ear-tag system, which can be fastened securely to the ear with a special tool. Ideally, both bucks and does are GPS collared to evaluate differences in movements, survival, and behavior of all animals in the population.



Photo by: Matt Kauffman

GPS collars work similarly to handheld or smartphone GPS units. GPS units use multiple satellites in the earth's orbit to triangulate the GPS unit's location in latitude and longitude coordinates. Today's technology can locate a deer within about 20 yards of their actual location. Location accuracy is affected by the number of satellites communicating with the GPS unit, so dense tree cover or steep topography can reduce accuracy. GPS collars are programmed to collect locations at a specified time interval, for example, one location every 1-3 hours. Some collars allow biologists to change the interval between locations remotely when the collar is still on the animal. There is a trade-off between more frequent locations or extended battery life, as more locations usually decreases how long the battery lasts. Some GPS collars are now incorporating solar power technology which can greatly extend the life of the collar.

The data collected by GPS collars is often stored internally within each unit. Many modern collars have the ability to transmit the data remotely to satellites which bounce them to web services, allowing biologists to view locations in real-time from their computer. Even with satellite communication, it is important that GPS units are physically recovered to ensure all location data are successfully retrieved. When a collared deer dies a mortality signal is sent to satellites, and the location is relayed to wildlife biologists via email or text message. This allows mortalities to be investigated quickly to determine cause of death. For some collars, a release mechanism is built into the collar that is programmed to drop off the deer at a specific time or triggered remotely through a satellite connection. Collars should be returned to agencies when found by hunters or the general public.

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## VALUE OF GPS COLLAR INFORMATION

Movement patterns and survival models are powerful tools to help in decision making. The locations derived from GPS collars can be visualized in a Geographic Information System (GIS), enabling biologists to create maps of animal movement. Statistical models use GPS locations to predict areas of use which are then overlaid on maps to identify important habitat, road crossings, time and location of fawning, or movement bottlenecks. GPS collars also give biologists information on survival rates to assess the effects of a winter or drought and to predict whether the population is likely to increase or decrease in the next year. Biologists can use the mortality location to investigate the cause of death such as malnutrition, predation, disease, fence entanglements, or vehicle collisions and assist in developing management strategies to reduce these losses.

## ETHICS AND USE OF COLLAR INFORMATION

Fair chase principles are a hallmark of ethical hunters and wildlife management agencies in North America. If GPS locations are available in real time, they could be used by unethical hunters to target collared animals in violation of the concept of fair chase hunting. Thus, agencies consider individual locations collected through GPS collars to be sensitive information, and in many cases are protected by state and provincial law or policy. Agencies take appropriate legal measures when sharing GPS location data, such as only releasing general maps of the areas used by deer, not the raw location data, and ensuring that they are not sharing real-time deer locations.

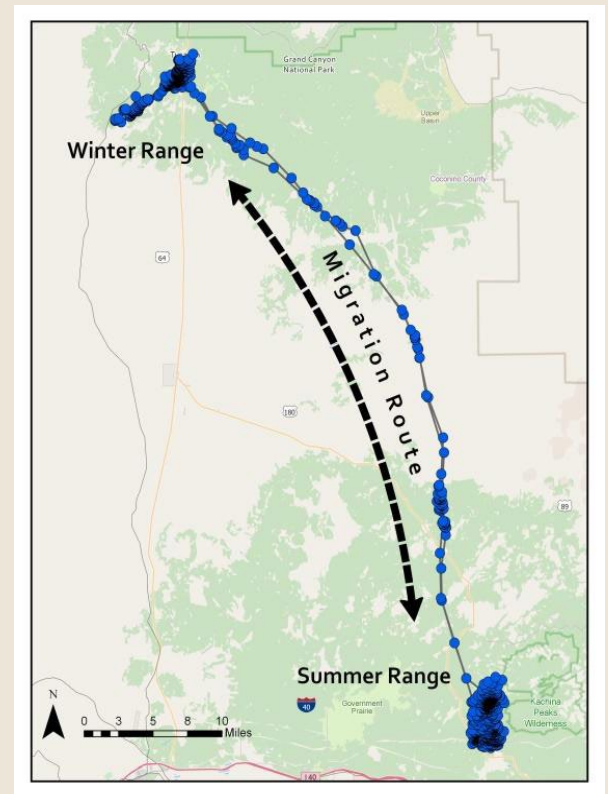
## WHEN YOU SEE A COLLARED ANIMAL

Occasionally, the public may encounter a collared mule deer. Unless it is wounded or acting strange there is no need to report the sighting. Take photos, and enjoy knowing that you are witnessing science in action. Mule deer hunters should always check their state or provincial hunting regulations regarding the harvest of collared animals. Some jurisdictions discourage hunters from harvesting animals with collars, while others encourage hunters to treat them as if they were not wearing a collar. Returning a GPS collar to the responsible wildlife agency is vital to the success of their research project.

## SUMMARY

GPS collars are used by wildlife biologists to collect locations of mule deer to better understand their movement, behavior, and survival. The process to capture and collar mule deer, track their movements, recover the collars, and analyze the data is complex and costly, but biologists are able to use these data to help inform management. Animal locations from GPS collars are considered sensitive information and not released without special protections in place to preserve private land confidentiality and hunting ethics. GPS collars have revolutionized our ability to identify the movement and distribution patterns of deer, and measurably increased the quality of survival information. This technology can contribute to dramatic improvements in mule deer management and our ability to conserve crucial mule deer habitat.

For additional information visit [www.muledeerworkinggroup.com](http://www.muledeerworkinggroup.com)



More information on mule deer can be found at [muledeerworkinggroup.com](http://muledeerworkinggroup.com)

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